tstron.
C.
QB
52
C223
1920/21
STORAGE
Physical &
Applied Sci.
Serials
UNIVERSITY OF TORONTO
LIBRARY
NOV 5 1921

University of Cambridge

SOLAR PHYSICS OBSERVATORY

EIGHTH ANNUAL REPORT OF THE DIRECTOR OF THE SOLAR PHYSICS OBSERVATORY TO THE SOLAR PHYSICS COMMITTEE

1920 APRIL 1—1921 MARCH 31

University of Cambridge

SOLAR PHYSICS OBSERVATORY

EIGHTH ANNUAL REPORT OF THE DIRECTOR OF THE SOLAR PHYSICS OBSERVATORY TO THE SOLAR PHYSICS COMMITTEE

1920 APRIL 1—1921 MARCH 31

Eighth Annual Report of the Director of the Solar Physics Observatory

21 *May* 1921.

The Vice-Chancellor begs leave to present to the Senate the following Report, which the Solar Physics Committee have received from the Director of the Solar Physics Observatory:

The Report here presented relates to the year 1920 April 1 to 1921 March 31.

E. A. Milne, B.A., Fellow of Trinity College, having been appointed Assistant Director, took up the duties of the office on 1 October 1920.

Mr W. E. Rolston resigned his post on the Staff in September 1920 and is still with the Army of Occupation at Cologne.

Mr Stratton and E. S. Pearson, B.A., Trinity College, continue research work on stellar spectra at the Observatory.

A. *Stellar Work.*

The memoir on the Spectrum of Nova Geminorum II prepared by Mr F. J. M. Stratton was published and distributed as Volume IV Part 1 of the Annals of the Observatory in the last days of 1920.

Mr Stratton, whose continued research work at the Observatory is warmly welcomed, has communicated to the Royal Astronomical Society a note on the Displacements of the Hydrogen lines in the spectrum of Nova Geminorum II (*Monthly Notices*, **81**, 200) dealing with the question whether the displacements concerned indicate a departure from proportionality to wave-length.

The measurement and reduction of the series of spectrograms of Nova Aquilæ III sent to the Observatory by Dr J. S. Plaskett, Director of the Dominion Observatory, Victoria, B.C., have now been completed by Mr Baxandall, and the results and discussion are being prepared for press. The material dealt with relates to 44 spectrograms taken between the dates 1918 June 10 and 1918 November 22, and serves well to throw light upon the nature of the elements which contribute the spectral characteristics of the Nova in the different phases of its early development. The measurement and reduction has been a heavy piece of work, involving a great deal of comparison of different spectra.

In a note "On the presence of absorption lines of Nitrogen and Oxygen in the spectra of Nova Aquilæ III," communicated to the Royal Astronomical Society in November (*Monthly Notices*, **81**, 66) Mr Baxandall gives a preliminary account of the evidence he has deduced from the study and measurement of the Victoria spectrograms.

Work of measurement and reduction on the structure of the emission lines in the spectrum of Nova Aquilæ III has been carried on by E. S. Pearson, B.A., Trinity College.

On the outburst of Nova Cygni III, discovered by Mr W. F. Denning on August 20 1920 a series of spectrograms was secured with the Huggins telescope and with the Newall telescope. The plates are being measured and reduced by Mr Stratton, and a preliminary note has been communicated to the Royal Astronomical Society (*Monthly Notices*, **81**, 50).

Mr Stratton has also secured a number of photographs of the spectrum of ζ Persei with a spectrograph adjusted for the study of the region near the H and K lines of calcium and attached to the Newall telescope. These plates are to be studied for periodic changes in the spectrum.

Theory of Radiative Equilibrium of Stars. Certain problems connected with the theory of radiative equilibrium of stars have been studied by Mr Milne. The theoretical distribution of temperature near the outer boundary of a star has been investigated, and the results of other writers carried to a further approximation on the basis of a certain integral equation. The temperature distribution thus found leads to a revision of the theoretical law of darkening of a stellar disc from centre to limb. A further consequence of the determination of the temperature distribution is that the distribution of energy in the continuous spectrum can be calculated, on the assumption that the coefficient of absorption is the same for all wave-lengths; it appears that the spectrum to be expected is not precisely the black-body spectrum for the same effective temperature but rather a spectrum with its position of maximum energy shifted about three per cent. to the violet. These results have been communicated to the Royal Astronomical Society in two papers (*Monthly Notices*, **81**, 361 and 375).

The modifications in the law of darkening and in the theoretical spectrum due to scattering and the effect of the Fraunhofer lines on the continuous spectrum are being studied further.

B. *Solar Work.*

Spectroheliograph. Photographs of the sun's disc in calcium $K_{2,3,2}$ light have been obtained on 74 days (previous year, 98) and photographs at the limb on 53 days (previous year 86). The photographs are taken on alternate days by Mr Butler and Mr Moss.

The general activity of the sun, as evidenced by the calcium flocculi, has exhibited further decline, with several moderate outbursts but with none of marked interest.

The 18-inch and 6-inch mirrors were dismounted on 1921 March 9 and were remounted on March 17 after being resilvered.

The Director of the Kodaikanal Observatory has forwarded 331 spectroheliograms showing the sun's disc in calcium $K_{2,3,2}$ light for the year 1920 January 1—December 31. Of the 35 days missed in the Kodaikanal records, there are Cambridge records for 8 days.

Study of the spectroheliograms. The examination of the Kodaikanal spectroheliograms has been continued by Mr Butler.

Photoheliograms. Daily photographs taken with the Dallmeyer photoheliograph at Dehra Dûn have been received as usual and the negatives are stored at the Science Museum, at South Kensington.

Study of Sunspot Records. The examination of the very valuable series of Greenwich Photoheliographic Results relating to the heliographic positions of groups of sunspots has been continued. The proper motions of 833 such groups in heliographic longitude and latitude having been studied in considerable detail for the cycle 1889—1901 by the Director with the assistance of Mrs Beech: the reductions of 565 similar motions have in the past year been completed by them for the cycle 1879—1889, and of 601 similar motions for the cycle 1902—1913 by Mr Moss. The results for the three cycles are now being compared. The epochs for the maxima of frequency of outbursts of spot groups in the earliest and latest cycles occur earlier in the northern hemisphere than in the southern; whilst in the middle cycle the epochs of maxima are nearly simultaneous in the two hemispheres. There are indications that systematic differences occur in the two hemispheres in regard to the relation between the motions in longitude and the latitude in which the spot groups are situated, and that these differences are related to the epochs of the maxima in frequency of groups in the two hemispheres. The discussion is now directed to elucidate this point.

C. *Meteorological Physics.*

Investigations in Atmospheric Electricity. The results of Mr C. T. R. Wilson's investigations on thunderstorms previous to 1920 were published in the *Philosophical Transactions of the Royal Society* (Series A, Vol. 221, 73). Further automatic records of the changes produced in the electric field by lightning flashes were obtained, by the method described in that memoir, during a number of thunderstorms in the summer of 1920.

Investigations were undertaken relating to the question of the magnitude of the continuous electric currents between the ground and thunderclouds or shower clouds.

Direct experiments were made to find the magnitude of the vertical potential gradient which has to be applied over grass-covered ground in order to produce point discharges from the grass. Measurements were made of the current per square metre of the ground when the potential gradient is increased beyond this limit. As was to be anticipated from what is known of discharge from points, the current due to this cause from a negatively charged grass surface begins to be appreciable at a somewhat smaller value of the potential gradient (about 15,000 volts per metre) than that from the same surface when positively charged. The magnitude of the current, whether positive or negative, increases very rapidly with increasing potential gradient and reaches values exceeding one ampère per square kilometre for such values of the potential gradient as are not unlikely to occur in thunderstorms.

Study of ionisation and ionising radiations by the condensation method. The apparatus and methods have been improved and stereoscopic pictures have been obtained.

D. *Miscellaneous.*

Lectures. Lectures have been given by the Director in the Michaelmas Term 1920 and the Lent Term 1921 on Spectroheliograms; and by Mr Wilson on Atmospheric Electricity; and by Mr Stratton on Stellar Physics.

The Director has pleasure in announcing that he has received a donation of £50 for the Solar Physics Fund from the Master and Fellows of Gonville and Caius College.

Library. A number of valuable publications and reprints have been received in the course of the year, and the Director desires to record his grateful acknowledgments to the donors. A list of such donations is appended.

H. F. NEWALL.

Solar Physics Observatory,
6 *May* 1921.

The Director gratefully acknowledges the receipt of the following works, which have been presented to the Library of the Solar Physics Observatory:

ASTRONOMY.

	Donors.
Allegheny Observatory. Publications. Vol. iv. No. 1—Vol. vi. No. 3. Lancaster, Pa., 1917–19. 4to.	The Observatory.
Antwerp, Société d'Astronomie. Gazette Astronomique. Vol. viii. Nos. 1—5. Anvers, 1920–21. 4to.	The Society.
Astrophysical Journal. Vol. li. No. 1—Vol. liii. No. 5. Chicago, 1920. 8vo.	Prof. Newall.
Barcelona. Boletin del Observatorio Fabra, Seccion Astronomica. No. 3. Barcelona, 1920. 4to.	The Royal Academy of Barcelona.
Brussels. Annuaire de l'Observatoire royal de Belgique. 1921–22. Brussels. 8vo.	The Observatory.
Brussels. Annales de l'Observatoire Royal de Belgique. Tome xiv. fasc. iii. Brussels, 1920. 4to.	,,
Cape of Good Hope. Royal Observatory. Annals. Vol. viii. Part iv. London, 1915. Fscp.	,,
Cape of Good Hope. Royal Observatory. Report of H.M. Astronomer. 1919. London, 1920. Fscp.	,,
Cape of Good Hope. Royal Observatory. Cape Astrographic Zones. Vol. iii. Cape Meridian Observations, 1909–11. Cape Fundamental Catalogue, 1900. London, 1915–17. 4to.	,,
Copenhagen, Observatorium. Publikationer og mindre Meddelelser. Nos. 35—36. København, 1920.	,,
Edinburgh, Royal Observatory. Annual Report, No. 30, 1919–20. Edinburgh, 1920. Fscp.	,,
Greenwich, Royal Observatory. Clock Star List, 1921. London, 1920. 4to.	,,
Greenwich, Royal Observatory. Annual Report of Astronomer Royal, 1919–20. London, 1920. 4to.	,,
Greenwich, Royal Observatory. Photo-heliographic Results, 1914–15. London, 1918–20. 4to.	,,
Harvard College Observatory. Annals. Vol. lxxxi. Parts 2—4; Vol. lxxxii. Part 3; Vol. lxxxiii. Part 4; Vol. lxxxiv. Part 4; Vol. xciv.; Vol. ci. Cambridge, Mass., 1919–20. 4to.	,,
Harvard College Observatory. Bulletins. Nos. 685—746. Cambridge, Mass., 1920–21. 4to.	,,
Harvard College Observatory. Circulars. Nos. 221—223. Cambridge, Mass., 1920–21. 4to.	,,
Harvard College Observatory. Report. No. 74. Cambridge, Mass., 1920. 8vo.	,,
Helsingfors, Observatoire. Catalogue Photographique du Ciel. Premiere Serie. Tome ii. Helsingfors, 1914. 4to.	,,
Hyderabad. Nizamiah Observatory. Annual Report, 1917–18 and 1918–19. Hyderabad. 1919–20. 8vo.	,,
Hyderabad. Nizamiah Observatory. Publications. Astrographic Catalogue. Vol. iii. Edinburgh, 1919. 4to.	,,
Java. First Catalogue of Radial Velocities. By J. Voûte. Natur. Tijds. Ned.-Indie. Deel lxxx. Weltervreden, 1920. 8vo.	The Author.

	Donors.
Johannesburg, Union Observatory. Circulars. Nos. 47—51. Johannesburg, 1919–20. 4to.	The Observatory.
Kodaikanal Observatory. Bulletins. Nos. 63—65. Madras, 1920. 4to.	,,
Kodaikanal Observatory. Memoirs. Vol. I. Part II. Madras, 1917. 4to.	,,
Lick Observatory. Bulletins. Nos. 328—329. Berkeley, Cal., 1920. 4to.	,,
Lick Observatory. Publications. Vol. XIII. Berkeley, Cal., 1918. 4to.	,,
London, Royal Astronomical Society. Memoirs. Vol. LXII. Appendix and Vol. LXIII. London, 1920–21. 4to.	The Society.
London, Royal Astronomical Society. Monthly Notices. Vol. LXXX. No. 4 —Vol. LXXXI. No. 3. London, 1919–20. 8vo.	,,
Madrid, Observatorio. Anuario, 1921. Madrid, 1920. 8vo.	The Observatory.
Ottawa. Dominion Observatory. Publications. Vol. IV. Parts 21—22; Vol. V. Part 1. Ottawa, 1920. 4to.	,,
Paris, Observatoire. Rapport Annuel, 1919. Paris, 1920. 4to.	,,
Prague. Über die Laplace'sche Theorie der Planetenbildung. Prague, 1920. 8vo.	The University Observatory.
Rio de Janeiro. Observatorio Nacional. Annuario, 1921. Rio de Janeiro, 1920. 8vo.	The Observatory.
San Fernando. Instituto y Observatorio de Marina. Almanaque Nautico y Suplemento, 1920–21. San Fernando, 1919–20. 8vo.	,,
Stockholm. Astronomiska Iakttagelser och Undersökningar. Band X. Nos. 1—6. Stockholm, 1912–17. 4to.	,,
Swarthmore, Pa. Sproul Observatory Publications. No. 5. Rep. Pro. Amer. Phil. Soc. Vol. LIX. No. 2, 1920.	,,
Torino. R. Osservatorio di Pino Torinese. Annuario Astronomico. Appendix for 1923. Torino, 1920. 8vo.	,,
Tortosa. Observatorio del Ebro, Roquetas, Spain. Boletín Mensual. Vol. X. No. 7—Vol. XI. No. 9. Tortosa, 1920–21. 4to.	,,
Upsala. Universitets Arsskrift, 1920. Matematik och Naturvetenskap 1. Upsala, 1920. 8vo.	,,
Victoria, B.C. Dominion Astrophysical Observatory. Publications. Vol. I. Nos. 1—12. Ottawa, 1919–20. 4to.	,,
Washington, Carnegie Institution, Department of Meridian Astrometry. Annual Report of the Director, 1916, 1919, 1920. Washington, 1920–21. 8vo.	The Institution.
Washington, United States Naval Observatory. American Ephemeris, 1922. Washington, 1921. 8vo.	The Observatory.
Washington, United States Naval Observatory. Annual Report, 1920. Washington, 1921. 8vo.	,,
Wellington, New Zealand Hector Observatory. Bulletin. Nos. 22—33. Wellington, 1919–21. 8vo.	,,

METEOROLOGY.

Argentina, Oficina Meteorologica. Boletin Mensual, Ap.—Aug. 1918. Buenos Aires, 1920. 4to	The Office.
Batavia. Royal Magnetical and Meteorological Observatory. Observations made at the Royal Magnetical and Meteorological Observatory. Vol. XXXVIII. Batavia, 1919. Fol.	The Observatory.
Batavia. Royal Magnetical and Meteorological Observatory. Observations made at Secondary Stations in Netherlands, East India. Vol. VII. Batavia, 1919. Fol.	,,
Batavia. Koninklijk Magnetisch en Meteorologisch Observatorium. Verhandlingen. Nos. 5—6. Batavia, 1920. 8vo.	,,
Brera. R. Osservatorio astronomico di Brera in Milano. Osservazioni Meteorologiche e Geofisiche, 1919. Milano, 1920. 4to.	,,
Canada. Dominion Meteorological Service. Monthly Record of Observations, Oct. 1919—Nov. 1920. Toronto, 1920–21. 4to.	Department of Marine and Fisheries.
Christiania. Geophysical Publications. Vol. I. Nos. 1, 3, 4. Christiania, 1920. 4to.	Geophysical Commissions.

	Donors.
Christiania. Norwegisches Meteorologisches Institut. Jahrbuch. 1919. Kristiania, 1920. Fol.	The Institute.
Christiania. Norske Meteorologische Institut. Nedbøriagttagelser i Norge. 1919. Kristiania, 1920. Fol.	,,
Edinburgh. Scottish Meteorological Society Journal. Vol. XVIII. No. XXXVII. 1919. Edinburgh, 1921. 8vo.	The Society.
Greenwich, Royal Observatory. Magnetic and Meteorological Results, 1914, 1915. London, 1920. 4to.	The Observatory.
Holland. Institut météorologique royal. Caractère Magnétique de chaque jour des mois. 1919 Trim. 4—1920 Trim. 3. de Bilt, 1920–21. Fol.	The Institute.
London, Meteorological Office. Daily Weather Reports. 1920, April—1921, March. London. 4to.	The Committee.
London, Meteorological Office. Weekly Weather Reports. 1920, Mar.—1921, Mar. London. 4to.	,,
London, Meteorological Office. Monthly Weather Reports. 1920, March—1921, Jan. London, 1920–21. 4to.	,,
London, Meteorological Office. Daily Readings at Meteorological Stations of the first and second orders. 1920. London, 1921. 4to.	,,
London, Meteorological Office. Geophysical Journal. 1919, Nos. 1—12. London, 1920–21. 4to.	,,
London, Meteorological Office. Reseau Mondial. 1910. London, 1920. 4to.	,,
London, Meteorological Office. Southport Auxiliary Observatory. Annual Report. 1919. London, 1920. 8vo.	,,
London, Meteorological Office. The Book of Normals of Meteorological Elements for the British Isles for periods ending 1915. Sections II. and III. London, 1920. 8vo.	,,
London, Meteorological Office. Hourly Values from Autographic Records. 1916–17. London, 1919–20. 4to.	,,
London, Meteorological Office. Reports from Colonial Stations. 1915. Various. 4to.	,,
Mauritius, Royal Alfred Observatory. Results of the Magnetical and Meteorological Observations. Sep. 1919—July 1920. Mauritius, 1920. 4to.	The Observatory
New Zealand. Government Meteorological Observatory. Meteorological Tables from the New Zealand Gazette. Dec. 1919—Dec. 1920. Wellington, 1920–21. Fscp.	,,
Oxford, Radcliffe Observatory. Results of Meteorological Observations. 1919. Oxford, 1920. 8vo.	,,
Prague. Die Windverhältnisse... Nov. 1916—Nov. 1917. Prague, 1920. 8vo.	The University Observatory.
San Fernando. Instituto y Observatorio de Marina. Anales, Seccion 2. 1918. San Fernando, 1920. Fol.	The Institute.
Stockholm. Svenska Sallskapet for Anthropologi och Geographi. Geografiska Annaler. 1920, H. 2–3. Stockholm, 1920. 8vo.	,,
Utrecht. Koninklijk Nederlandsch Meteorologisch Institut. Ergebnisse Aerologischer Beobachtungen. 1915–16–17. Utrecht, 1916–18. 8vo.	,,
Utrecht. Koninklijk Nederlandsch Meteorologisch Institut. Jaarboek A Meteorologie, B Aard magnetisme. 1915–16–17. Utrecht, 1916–18. 4to.	,,
Upsala. Bulletin Mensuel de l'observatoire Meteorologique de l'Université d'Upsala. Vol. LI. 1919. Upsala, 1920. 8vo.	The Observatory.
Upsala. Kungl. Svenska Vetenskapsakademiens Handlingar. Band LVIII. No. 4. Stockholm. 8vo.	The University.
Washington. Carnegie Institution. Department of Terrestrial Magnetism. Annual Report of the Director. 1920. Washington, 1921. 8vo.	The Institution.

Cambridge: Printed at the University Press

Digitized by the Internet Archive
in 2009 with funding from
University of Toronto

http://www.archive.org/details/reportofdirector1920camb